

# Na LMR R&D Planning

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# Overview of the Presentation

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- *Quick status of TWG 3 R&D Scope Report*
- *Specific concept notions*
- *Principles that drive the R&D planning*
- *Pyroprocess R&D*
- *Advanced Aqueous Process R&D*
- *Reactor R&D*

# TWG 3 R&D Scope Report

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- *Scope is L1/L2 and L6/L4*
- *~235 pages that includes descriptive material, concept rationale, synergies, R&D plans, summary R&D tables, PRIMAVERA schedules (for fuel cycle only)*
- *Intent was an encyclopedia from which RIT needs could be satisfied*

# TWG 3 R&D Summary Tables

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- *~25 pages in 5/31 and 6/24 drafts*
- *Obviously need prioritization, rollup, integration*
- *Little peer review thus far: a main subject of TWG 3 business tomorrow*
- *Cost estimates largely missing*

# Na LMR Concepts That Drive R&D Choices

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- *Metal-alloy fueled reactor, range of sizes from medium to large, pyroprocess fuel cycle (L2)*
- *Oxide fueled reactor, same range of sizes, advanced aqueous-based process (L1)*
- *Other dry processes also recognized, but little emphasized*

# Principles that Guide the R&D Planning

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- *Fuel Cycle R&D deserves heavy emphasis*
- *Fuel cycle technology development must consider LWR spent fuel*
- *Na LMR reactor technology is anything but static or a done-deal. Reactor-related R&D is needed , in some cases to capture innovations that can lead to significant cost reduction:*
  - *fuels and materials*
  - *passive and/or inherent safety assurance*
  - *inservice inspection and repair*
  - *components etc.*

# Pyroprocess Viability R&D

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- *Application of pyroprocess applicability to LWR spent fuels*
  - *Demonstrate pyrochemical reduction of oxide fuel*
- *Demonstration of actinide recovery, recycle*
  - *TRU recovery demonstration*
  - *Develop drawdown system for actinide removal from salt*
- *Minimization of HLW*
  - *Development of ion exchange system to reduce ceramic waste volume*
- *Develop integrated safeguards*

# Advanced Aqueous Process (and Simplified Remote Pellet Fabrication) R&D

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- *Separations Process Development*
  - *Development of powdering decladding system*
  - *Verification of uranium crystallization performance*
- *Simplified Pellet Fabrication*
  - *Development of denitration/conversion turntable system*
  - *Confirmation of fabricability (e.g. sinterability) of MA-bearing MOX*
  - *Verification of weld inspection methods for ODS cladding*
  - *Demonstrate remote operability/maintainability of fab equipment*
  - *Development of alternative gelation fab method*
- *Waste Management*
  - *Minimization of TRU waste (salt-free reagent; improved decon technology)*
- *Integrated safeguards*





# Alternative Dry Process (and Vibropac Fuel Fabrication) Viability R&D

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- *Verification of MOX co-deposition in electrowinning*
- *Verification of vibropac process*
- *Assurance of vibropac equipment operability/maintainability*

# Fuels Viability R&D

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- *Irradiation performance of remotely-fabricated fuel containing prototypic minor actinides (metal or oxide)*
- *Key thermophysical property confirmation for MA-bearing metal fuel*
- *Modeling and basic data for fuel/cladding interdiffusion and fuel constituent migration for MA-bearing metal fuels*

# Safety Viability R&D

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- *Complete the data base for axial expansion of metal fuel in overpower transients*
- *Verification of the key reactivity feedbacks in undercooling accidents, radial expansion and assembly bowing*
- *Development of Curie-point magnet alloys for use in SASS systems*

# How TWG 3 Handled R&D Scheduling

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- *In the Scope Report of 6/24, we developed PRIMAVERA schedules only for fuel cycle R&D*
- *Tentative plan is to expand to all the Na LMR and Pb-Bi Battery R&D*
- *Closing slides show how this looks for the Pyroprocess R&D*





